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The Pungency Taste Characteristics of Some Piperazine Derivatives

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Staudinger and Schneider (*1*) found that the piperidides of β-cinnamenyl acrylic acid, 5-phenyl-2-pentenoic acid, 5-phenyl-3-pentenoic acid, and 5-phenyl-*n*-valeric acid have the same pungent taste characteristics of the piperine of black pepper, *Piper nigrum*. Riccomanni (*2*) reported that the piperidine nucleus could be substituted by piperazine and stated that the di-(5-phenyl-3-pentenoyl)-piperazine has a biting peppery taste.

On repeating the work of Riccomanni, it was found by the authors that, although the crude product does have a pungent taste, this is not due to the diacyl piperazine, but to the presence of the di-5-phenyl-3-pentenoyl piperazonium salt, which can be removed from the crude product by water extraction.

The diacyl piperazine and the diacyl piperazonium salts in this investigation were prepared substantially in the manner recommended by Pollard and Adelson (*3*) for these types of compounds. The former were prepared by reacting the corresponding acyl chloride with piperazine hexahydrate, and the latter by heating equimolecular amounts of acid and base. Both series of compounds were then purified by recrystallization from appropriate solvents.

Table 1 gives some of the properties of the compounds prepared. The melting points of the piperazonium salts are not reliable values for determining their purity, as the salts split off water on heating to form diacyl piperazines. None of the diacyl piperazines has the pungent taste of pepper, whereas all the corresponding diacyl piperazonium salts have this characteristic flavor to a marked degree.

TABLE 1

DIACYL PIPERAZINES AND PIPERAZONIUM SALTS

Compound	Formula	Mp (uncorr.)	Nitrogen, %		Remarks
			Calcd	Found	
Piperazines					
Di-β-cinnamenyl acrylyl	$C_{26}H_{26}O_2N_2$	209–9.5°	7.04	7.08*	No taste; water-insoluble
Di-5-phenyl-2-pentenoyl	$C_{26}H_{30}O_2N_2$	150–1°	6.97	6.73*	
Di-5-phenyl-3-pentenoyl	$C_{26}H_{30}O_2N_2$	Oil	6.97	5.67*	Decompn on vac distn
Di-5-phenyl-*n*-valeroyl	$C_{26}H_{34}O_2N_2$	64.5–65°	6.89	7.15*	
Piperazonium Salts					Pungent taste; water-soluble
Di-β-cinnamenyl acrylyl	$C_{26}H_{30}O_4N_2$	196–7°	6.45	6.32; 6.35†	
Di-5-phenyl-2-pentenoyl	$C_{26}H_{34}O_4N_2$	152–3°	6.39	6.31; 6.27†	
Di-5-phenyl-3-pentenoyl	$C_{26}H_{34}O_4N_2$	126.7°	6.39	6.56; 6.64†	
Di-5-phenyl-*n*-valeroyl	$C_{26}H_{38}O_4N_2$	119.5°	6.31	6.44*	

* Analyses by Samuel P. Sadtler & Son, Philadelphia, Pa.
† Analyses by Micro-Tech Laboratories, Skokie, Ill.

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